Notes on South Australian Marine Mollusca, with Descriptions of New Species.—Part VI.

By Jos. C. Verco, M.D. (Lond.), F.R.C.S. (Eng.).

[Read August 6, 1907.]

Plates XXVII. and XXVIII.

Sepia braggi, *sp. nov.* Pl. xxvii., figs. 6, 6*a*, 6*b*, 6*c*, 6*d*.

The animal from which this cuttlebone comes is unknown. It is 60 mm. long by 11 mm. broad at its widest part, with a maximum thickness of 4·75 mm. The dorsal surface is very slightly convex in its anterior two-thirds, but markedly curved in the posterior third. The mucro of 2·75 mm. in length projects at an angle of about 135°. The maximum width and thickness is at 20 mm. from the anterior end, which is sharply rounded. Posteriorly it uniformly narrows to a minimum of 3 mm., and at its extreme end terminates in a thin circular expansion, 4 mm. in diameter, which extends about 1·5 mm. beyond the base of the projecting spine.

An orange-coloured line arises at the margins at the point of maximum width, and becomes plainer and wider as it extends backwards, and more prominent ventrally till it projects nearly a millimeter in height, and is half a millimeter in width at the posterior end of the white substance, around which it circles. A longitudinal central furrow deepest just in front of the widest part of the shell, grows shallower and wider anteriorly, and nearly vanishes at the posterior end. Dorsally a very low rounded central rib increases posteriorly to a width of 3 mm., and midway between it and the margins of the bone is a scarcely perceptible longitudinal depression.

Its nearest ally is *S. elongata*, Fer and Orb, Céph Seiches, t. 24, f. 7-10, 1839; Tryon, Man. Conch., vol. i., p. 195, pl. xci., figs. 418, 419. *Hab.*, Red Sea. The animal of that species is also unknown. The sepiostaire as figured in Tryon is only 45 mm. long, is less attenuated posteriorly, has a comparatively wider hollow expansion at the posterior end, is curved for a much shorter length posteriorly, and has its spine not set at an angle, but curving backward, so as to continue the nearly straight dorsum of the bone. The chalky substance, too, seems much thicker, and to more suddenly decrease forward. The dimensions are not given in Tryon's text.

Hab.—The type was found at Glenelg by Master Bragg, and we have pleasure in naming it after him, and at the same time complimenting his father, Prof. Bragg, one of our most honoured Fellows, who has just been distinguished by the Fellowship of the Royal Society of London.

Mr. Zietz has also taken eight specimens during ten years' collecting on our beaches; so that it is a rare species here.

Mr. Hedley says it does not seem to occur on the Pacific coast of Australia, but he has it from Victoria.

Arcularia dipsacoides, Hedley. Pl. xxix., fig. 13.

Arcularia dipsacoides, Hedley, Records Austr. Mus., vol. vi., part 5, 1907, p. 359, pl. lxvii., f. 21. Type locality, 800 fathoms 35 miles E. of Sydney.

Dredged off Cape Jaffa, in 130 fathoms, 41 examples; in 300 fathoms, 10, all dead.

Two individuals were taken alive in 130 fathoms, off Cape Jaffa, and furnished radulæ. They contain about fifty-three rows, and are of the ordinary rachiglossa type. A large lateral with two well-curved simple cusps fold over a rachidian tooth with ten cusps, of which the outermost on each side is very small. In one individual, one cusp situated at the centre is the largest and has frequently five cusps on one side and four on the other. In the second individual, the middle two are largest. The rest vary very much in relative length in different rows, so that scarcely any two rachidian teeth exactly correspond.

Vermicularia flava, n. sp. Fig. 1.

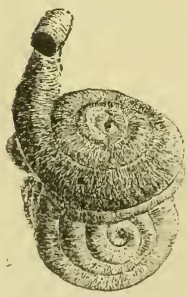

Fig. 1.

Shell an ochre-yellow-coloured tube, varying in diameter from 1 to 1·5 mm., moderately thick, coiled in flat discs of 5 or 6 mm. in diameter, each formed of three or four spirals; the discs are superimposed to form a cylinder. Section of tube circular. Surface has sinuous growth-lines, Ante-current at the margins of attachment to adjacent coils and at the centre of the free surface, varying in validity, sometimes erected into a collar. The anterior end stands free.

The type, after forming a flat cylinder of two discs, produces two more discs at right angles to these, and then has a free tube of 7 mm. length. The discs may be formed from the centre outwards, or from the circumference inwards. The

free portion may be 15 mm. long. No nucleus has been seen.

Type locality.—130 fathoms, off Cape Jaffa; also in 90 fathoms, 37 dead; in 40 fathoms, off Beachport, one dead.

Mangilia spica, Hedley.

Records of the Austr. Mus., vol. vi., pt. 4, 1906, p. 297, pl. lv., fig. 20. Type locality, off Narrabeen, N.S.W., 80 fms., 2 examples, 100 fms., off Wollongong 1.

Dredged at 40 fathoms, off Beachport, one dead; and at 110 fathoms, one dead.

The South Australian shells vary from the type in having six spirewhorls instead of four; and the four earlier whorls are not quite so long as those which form the spire of the type, the axial ribs are more numerous, and are less marked below the suture.

Drillia hecatorguia, n. sp. Figs. 2 and 3.

Shell small, stout, biconic, whorls six. Protoconch flat, two smooth convex turns. Spirewhorls with a sharp medial angulation, undulated by pliciform tubercles (nine in the penultimate) plicæ reaching the lower suture; suture slightly adpressed. Growth-lines microscopic. Bodywhorl half as long as the shell; excavated below the suture, then acutely angled; faintly concave immediately below the angulation, then scarcely inflated, and next roundly contracted in the lower third. Tubercular plicæ wide, extend from the angle, soon become obsolete. Growth-lines faint, rude near the aperture. Sinus half as deep again as wide, bounded by the angle. Aperture oblique, length nearly four times its width, elongate-oblong. Outer lip simple, thin, convex. Columella convex in posterior half, straight anteriorly. Inner lip thin, applied, slightly spread, extending to suture. Anterior notch moderately wide. Colour translucent white, faintly tinged with brown.

Fig. 2.

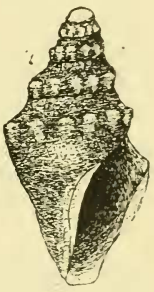

Fig. 3.

Dim.—Length, 6·1 mm.; breadth, 2·8 mm. Length of aperture, 3·2 mm. The largest example is 7 mm. long.

Type Locality.—104 fathoms, 35 miles south-west of Neptune Islands; 28 dead.

Nucula micans, Angas.

Nucula micans, Angas. Proc. Zool. Soc., Lond., 1878, p. 864, pl. liv., f. 16. Type locality, shell sand, Salt Creek; Glenelg, St.

Vincent Gulf: Tate, Trans. Roy. Soc., South Australia, 1887, vol. ix., p. 102, No 125; Tate and May, Proc. Linn. Soc., N.S. Wales, 1901, vol. xxvi., part 3, p. 435, "Tasmania"; Pritchard and Gatliff, Proc. Roy. Soc., Vict., 1904, vol. xvii. (N.S.), part 1, p. 237, "Victoria."

Locality.—Taken on the beach at MacDonnell, Rivoli, and Guichen Bays; many dredged alive in 5 fathoms, St. Vincent Gulf, and in 20 fathoms Backstairs Passage; valves dredged in Spencer Gulf, and also in 40 and 150 fathoms off Beachport, and one valve in 130 fathoms off Cape Jaffa.

Nucula beachportensis, *sp. nov.* Pl. xxvii., fig. 3.

Oval-trigonal, moderately solid. Umbos prominent, inflated, slightly opisthogyre, incurved. Teeth about thirteen anterior, solid and curved; six posterior. Fossa for the internal cartilage rather small, directed forwards and inwards. Dorsal border very slightly excavate just behind the fossa, then convex, then straight to the posterior inferior angle; ventral border with a uniform curve, joining with a smaller curve the anterior dorsal border, which has a very slight convex arcuation, and is about twice as long as the posterior. Inner ventral margin minutely crenulate.

Sculpture.—Smooth, but for obsolete rounded concentric striæ at irregular distances, and scanty microscopic radial striæ.

Dimensions.—Umbo-ventral, 4·6 mm.; antero-posterior, 4·9 mm.

Locality.—Dredged off Beachport, 40 fathoms, 1 perfect (type), 2 valves; in 100 fathoms, 1; 150 fathoms, 2; 200 fathoms, 1; off Cape Jaffa in 130 fathoms, 1; 300 fathoms, 6; all dead.

Diagnosis.—It is very like *N. micans*, Angas, but is a larger shell, is smoother, is not so uniformly rounded behind, but is truncated or straight from the end of the hinge to the ventral border, and the crenulations are fewer and more valid.

Nucula obliqua, Lamarck.

Nucula obliqua, Lamarck. Anim. s. Vert., 1819, vol. vi., p. 59; Chenu, Man. Conch., vol. ii., 1862, p. 179, f. 897; Hedley, Mem. Austr. Mus., 1902, iv., p. 292. *N. tumida*, Ten. Woods. Proc. Roy. Soc. Tasm., 1877 (1876), p. 111 (*non* Phillips, Illus. Geol. Yorkshire, 1836, part 2, pl. v., f. 15; *nec* Hinds, Proc. Zool. Soc., Lond., 1843, p. 98). Type locality, Eocene fossil, Table Cape, Tasm. *N. tenisoni*, Pritchard, Proc. Roy. Soc. Vict., 1896, vol. viii., p. 128.

Dredged off Cape Jaffa, in 90 fathoms, 1 valve; in 130 fathoms, 16 valves; in 300 fathoms, 1 alive, small, and 3 valves; off Beachport, in 110 fathoms, 34 valves; in 150 fathoms, 19 valves; in 200 fathoms, 24 valves.

Leda crassa, Hinds.

Nucula crassa, Hinds, Proc. Zool. Soc. Lond., 1843, p. 99. Type locality, Australia; *Leda crassa*, Hinds, Sowerby, Thes. Conch., vol. iii., 1860, p. 120, pl. 228, f. 69; Sowerby, Conch. Icon., 1871, vol. xviii., pl. 5, f. 27; Angas, Proc. Zool. Soc. Lond., 1877, p. 193; Ten. Woods, Proc. Roy. Soc. Tasm., 1878, p. 32; E. A. Smith, Chall., Zool., 1885, xiii., p. 237; Tate, Trans. Roy. Soc. South Austr., 1887, ix., p. 102, No. 126; Tate & May, Proc. Linn. Soc. N.S. Wales, 1901, xxvi., pt. 3, p. 435; Hedley, Mem. Austr. Mus., 1902, iv., pt. 5, p. 294; Pritchard & Gatliff, Proc. Roy. Soc. Vict., 1904, xvii. (N.S.), pt. 1, p. 238. *Leda chura*, Gray in Juke's Voy. Fly., 1847, vol. ii., app. p. 356, pl. ii., f. 6; Sowerby, Thes. Conch., 1860, iii., p. 119, pl. 228, f. 67; Sowerby, Conch. Icon., 1871, xviii., pl. 7, f. 46.

Dredged, Investigator Strait, 14 fathoms, 8 alive; off Middleton, 17 fathoms, many alive, adult; 18 miles off Newland Head, in 26 fathoms, 24 alive, mostly small, and great numbers of very small examples; off Beachport, in 110 and 150 fathoms, 3 and 4 valves (Dr. Verco).

Leda dohrni, Hanley.

Leda dohrni, Hanley, Proc. Zool. Soc. Lond., 1861, p. 242. Type locality, Mare Pacificum (Mus. Dohrn). *Id.* Hedley, Thetis Exped., Memoirs Austr. Mus., iv., pt. 5, 1902, p. 294. *Leda dohrnii*, Hanley (A. Ad.), Sowerby, Conch Icon., xviii., 1871, Leda, pl. lx, f. 54. *Leda hanleyi*, Angas, Proc. Zool. Soc., 1873, p. 174, pl. xx., f. 7; *teste* Hedley, *loc. cit.*

Dredged off Beachport, in 110 fathoms, 6 valves; in 150 fathoms, 10 valves; off Cape Jaffa, in 130 fathoms, 7 valves (Dr. Verco).

Leda verconis, Tate.

Leda verconis, Tate, Trans. Roy. Soc. South Austr., 1891, vol. xiv., p. 264, pl. xi., fig. 4.

Dredged alive in Spencer's Gulf, as far up as Wallaroo Bay, also in St. Vincent Gulf, in Investigator Strait, and Backstairs Passage. It occurs alive at all depths from 8 to 22 fathoms, being very numerous at 8, at 15, and at 22 fathoms. None were taken in the depths from 45 to 300 fathoms.

Leda pala, Hedley.

Leda pala, Hedley, Records Austr. Mus., vol. vi., part 5, 1907, p. 361, pl. lxvi., fig. 1. Type locality, 800 fathoms E. of Sydney.

Dredged off Cape Jaffa, in 130 fathoms, 2 valves.

Leda miliacea, Hedley.

Leda miliacea, Hedley, Thetis Exped., Mem. Austr. Mus. iv., pt. 5, p. 295, fig. 43: valves, 63-75 fathoms off Port Kembla, and 41-50 fathoms off Cape Three Points.

Dredged in 300 fathoms off Cape Jaffa, 5 valves (Dr. Verco).

Poroleda ensicula, Angas.

Leda ensicula, Angas, Proc. Zool. Soc., 1877, p. 177, pl. xxvi., f. 27. Type locality, off Port Jackson Heads, 45 fathoms. *Id.*, Smith, Chall. Rep. Zool., xiii., 1885, p. 239. *Id.*, Hedley, Thetis Exped., Mem. Austr. Mus., iv., pt. 5, 1902, p. 293, fig. 41. *Id.*, Pritchard & Gatliff, Proc. Roy. Soc. Vic., xvii. (N.S.), pt. 1, 1904, p. 239.

Dredged off Beachport, in 100 fathoms, 2 valves, in 110 fathoms 12 valves, in 150 fathoms very many valves, in 200 fathoms 8 valves; off Cape Jaffa, in 90 fathoms 5 valves, in 130 fathoms 6 valves; off Cape Borda, in 60 fathoms 2 valves.

Sarepta obolella, Tate.

Leda obolella, Tate, Trans. Roy. Soc. S. Austr., vol. viii., 1886, p. 129, pl. v., figs. 3*a* and *b*. Type, a tertiary fossil from Muddy Creek. *Sarepta tellinœformis*, Hedley, Records Austr. Mus., 1901, vol. iv., p. 26, fig. 8; 75 fathoms 5 miles E. of Sydney Heads. *Sarepta obolella*, Tate; Hedley, Memoirs Austr. Mus., 1902, vol. iv., part 5, p. 295; off Port Kembla 63-75 fathoms, and Cape Three Points 41-50 fathoms.

Dredged off Cape Jaffa, in 300 fathoms, 1 whole, 6 valves.

Limopsis tenisoni, Ten. Woods.

Limopsis cancellata, Ten. Woods (*non* Reeve), Proc. Roy. Soc. Tasm., 1877 for 1876, p. 156. Type locality, north coast of Tasmania. *L. tenisoni*, Ten. Woods, Proc. Roy. Soc. Tasm., 1878 for 1877, p. 56; Hedley, Memoirs Austr. Mus., vol. iv., part 5, p. 297; Pritchard & Gatliff, Proc. Roy. Soc., Vic., 1904, vol. xvii. (N.S.), part 1, p. 245, "Victoria." *L. bassi*, E. A. Smith, Chall. Zool., 1885, vol. xiii., pp. 14, 256, pl. xviii., f. 6-6*a*, "East Moncœur Is., Bass Strait, 38 fathoms"; Tate, Trans. Roy. Soc. S. Austr., 1887, vol. ix., p. 103, No. 136, "South Australia"; Tate and May, Proc. Linn. Soc. N.S. Wales, 1901, vol. xxvi., part 3, p. 437.

Is abundant throughout St. Vincent and Spencer Gulfs, Investigator Strait, and Backstairs Passage, being taken alive at all depths from 10 fathoms up to 30 fathoms. One example was taken alive from 55 fathoms off Cape Borda, and valves have been dredged at all depths up to 130 fathoms off Cape Jaffa; none beyond this depth.

It is a very variable species. Some individuals are almost orbicular, others are extremely oblique, some have the radial sculpture very valid, others obsolete. The epidermis may be smooth, silky, and uniform, or disposed in marked concentric fringes. The brown colouration may be very deep and general, or only in certain parts, or nearly absent. But any attempt to separate into different species is vain.

Limopsis tenisoni, Ten. Woods; var. penelevis, *var. nov.*

Pl. xxvii., fig. 5.

Shell obliquely oval. Dorsal margin nearly straight. External surface with concentric growth lines, varying in

validity, somewhat imbricating; dotted at their convex margins by short, disconnected, sublenticular radial impressions, more marked over the posterior part of the shell, and as the shell grows larger. Internal margin non-crenulated and flattened. Tooth-plate rather curved; about 14 teeth. Milk-white.

Dimensions.—Umbo-ventral, 16·5 mm.; antero-posterior, 15 mm.; sectional of the closed valves, 5·5 mm.

Locality.—Valves dredged off Cape Jaffa and Beachport from 90, 130, 150, 200, and 300 fathoms.

It differs from the ordinary form in the almost complete absence of radial sculpture.

Limopsis vixornata, *sp. nov.* Pl. xxvii., fig. 1.

Shell solid, white, equivalve, nearly equilateral, transversely orbicularly oval. Umbo acute, projecting well beyond the dorsal border, incurved. Inner margin smooth and flat. External surface smooth, but for concentric growth lines, which at fairly regular intervals are more valid, so as to form subdistant liræ. Under the lens traces of radial incisions are visible, especially over the posterior area. Cartilage pit triangular; 11 solid diverging teeth in a curved series. Interior closely radially striate.

Dimensions.—Umbo-ventral, 5·7 mm.; antero-lateral, 6·4 mm.; largest, 8·1 mm. by 9 mm. Some have a short, straight dorsal border, shorter anteriorly than posteriorly, and with the radial impressions rather more marked. One has an epidermis, worn away near the umbo, and projecting at the ventral margin for about a millimetre and a half as a continuous radially striated membrane, which on the surface of the shell breaks up into a hairy coating.

Locality. — Type from 45 fathoms, east of Neptune Islands, with 4 valves and 1 living specimen; from 49 fathoms, off Beachport, 23 valves; also at 55 and 62 fathoms, off Cape Borda, and 110 fathoms off Cape Borda.

Diagnosis.—The transversely oval shape, the prominent umbo, and the unsculptured surface separate it from *L. tenisoni*, Ten. Woods; but possibly it is only a variant.

Limopsis eucosmus, *sp. nov.* Pl. xxvii., fig. 2.

Shell solid, rather compressed, white, obliquely orbicular, slightly higher than wide. Umbos central, prominent, incurved approximate. Cartilage-pit small, triangular. Tooth-plate slightly curved; teeth, 5 anterior, 6 posterior, somewhat diverging. Inner margin flat and smooth. Interior obsoletely radially striate. Posterior muscle-scar large and long; anterior, short and narrow. Outer surface ex-

quisitely sculptured with flat concentric ribs, varying greatly in width, some twice, some four times as wide as the interspaces; others are only cords, not so wide as the intervals. They are higher on their convex than their concave edge. Numerous radial liræ, increasing by intercalation, scallop the ribs more markedly along their concave than their convex margin, forming circular depressions in the interspaces. At the anterior and posterior areas of the shell these scallops become triangular rather than circular, and so form lozenges in the interspaces. Where the radials cross the ribs, if these are very narrow, they produce a tubercle with a central radial furrow; if wide, they cross as a lira, with a central furrow, and sometimes another radial furrow is found on either side of this.

Dimensions.—Umbo-ventral, 8 mm.; antero-posterior, 7·5 mm.; section of closed valves, 3·25 mm.; largest example, 10·5 mm. by 10·3 mm.

Locality.—Type, off Cape Jaffa, from 90 fathoms, with 1 other valve; 35 miles south-west of Neptune Islands, from 104 fathoms, 62 valves.

Limopsis erectus, Hedley and Petterd.

Limopsis erectus, Hedley & Petterd, Records Austr. Mus., vol. vi., part 3, p. 224, pl. xxxviii., figs. 14, 15. Type locality, 250 fathoms, off Sydney.

Dredged 35 miles south-west of Neptune Islands, 104 fathoms, 6 valves; off Beachport, 150 fathoms, 1 valve, 200 fathoms, 1 valve; off Cape Jaffa, 130 fathoms, 17 valves, and 300 fathoms, many small and mostly poor valves, but some with epidermis. The epidermis is abundant, of flaxen, bristly setæ, long towards the ventral border.

Nuculina (**Cyrilla**, A. Adams, s.g.) **concentrica**, n. sp.

Pl. xxvii., figs. 4, 4*a*, 4*b*.

Minute, obliquely-oval, equivalvular, inequilateral, higher than long, moderately solid, white, smooth, with six concentric equidistant imbricating steps. Umbos prominent, prosogyre, incurved, approximate. The front side at the upper third is oblique and nearly straight, being faintly incurved; then rather suddenly roundly angulated, beyond which it is uniformly openly curved. The posterior side has a uniform gentle arcuation, and the basal outline is distinctly more sharply curved. The hinge-plate is broad. The teeth of the left valve lie in front of those in the right valve, and the left lateral tooth lies outside the right. There are six cardinal teeth in each valve, all behind a pit lying beneath and slightly in front of the umbo. The three nearest

the pit are nearly vertical and laminar, and rather close together; especially the first two; the posterior three become gradually more distant, stouter especially at their outer ends, shorter, and more diverging, lying perpendicular to the curving posterior margin. The last one in the right valve is peg-shaped. Behind, there is a rather long lamellar triangular tooth. The posterior muscle-scar is very large, curved, and oval, and placed low down beyond the lateral tooth. The inner margin is smooth and simple. The shell is covered with a dark-brown, smooth, shining, closely-adherent epidermis, which wears off dead shells, remaining last about the umbos. Dead shells are translucent, milky-white.

Dimensions.—Umbo-ventral diameter, 2·5 mm.; antero-posterior, 1·9 mm.; section of closed valves, 1·6 mm.; a large example is 3 mm. by 2·3.

Habitat.—104 fathoms, 35 miles south-west of Neptunes, many alive and dead, and valves.

Some Ostracoda, taken in the same haul, are very like them.

Lissarca pubricata, Tate.

Limopsis rubricata, Tate, Trans. Roy. Soc. South Austr., 1886, vol. ix., p. 71, pl. v., fig. 6. Type locality, alive from 32 fathoms, Backstairs Passage; *op. cit.*, p. 104, No. 138; Tate and May, Proc. Linn. Soc. N.S. Wales, 1901, vol. xxvi.; part 3, p. 437, Pirate Bay, Tasmania; Hedley, Memoirs Austr. Mus., 1902, vol. iv., part 5, p. 297, valves, 41-50 fms., off Cape Three Points; Pritchard & Gatliff, Proc. Roy. Soc. Vict., 1904, vol. xvii. (N.S.), part 1, p. 246, Western Port.

Taken alive in Backstairs Passage, 17 fathoms; dead in St. Vincent Gulf, and off Cape Borda, in 62 fathoms, dead, but perfect. It is recorded from Cape Borda, round the coast of Victoria and Tasmania, to New South Wales.

Tate remarks:—"Probably a young shell, but not referable to any known species." Abundant material proves it to be full grown, and a distinct species. There are 5 radial flames, increasing in width as they diverge. Tate gives four.

Lissarca rhomboidalis, n. sp. Pl. xxvii., fig. 7.

Shell minute, solid, translucent, horn-coloured, ovate-rhomboid, equivalve, inequilateral, about twice as long behind the umbo as in front. Umbos prominent, round, wide, slightly prosogyre. Dorsal border faintly uniformly curved, continuing into the narrowly-rounded anterior end, and into a much more widely-curved posterior end, which is faintly truncated behind. There is a perceptible excavation where the anterior end joins the ventral border. A narrow sub-umbonal area, bounded outside by a straight, slightly prom-

inent rounded edge, is marked with numerous very close-set vertical striæ, and does not extend so far in front as behind, where it gradually narrows and vanishes. It is divided by a rather wide, shallow, subcentral triangular cartilage-pit. There are four anterior teeth perpendicular to the margin, and four posterior convexly curved towards the umbo; three or four small marginal teeth inside the anterior end, four at the post-dorsal margin, and three or four obsolete teeth at the post-ventral border. Margin otherwise simple. Posterior muscle-scar long, large, triangular. Crowded concentric, rather irregular accremental striæ, with very fine broken radial incisions.

Dimensions.—Antero-posterior, 2·4 mm.; umbo-ventral, 2 mm.

Locality.—MacDonnell Bay and Guichen Bay, in shell-sand.

Variations.—When dead they become white, the amber colour disappearing first about the umbo, and last about the ventral margin. Some show four obscure rounded radial ridges, from the umbo to the posterior inferior angle; and these may crenulate the margin. Dorsally to these the shell may be somewhat hollowed. The posterior marginal teeth may crenulate the border, as may also the front teeth.

Bathyarca perversidens, Hedley.

Bathyarca perversidens, Hedley, Memoirs of Australian Mus., 1902, vol. iv., part 5, p. 298, fig. 45. Type locality, off Port Kembla, in 63-75 fathoms, etc. Var.—*Bathyarca cybœa*, Hedley, Trans. New Zealand Inst., 1906, vol. xxxviii., 1905, p. 70, pl. 1, figs. 3-4. Type locality, 110 fathoms, east of Great Barrier Island, New Zealand.

Dredged off Cape Jaffa, in 130 fathoms, 2 valves; in 300 fathoms, very many valves.

A series was submitted to Mr. Hedley as *B. cybœa*, and he kindly compared with his types and confirmed the identification. A suggestion was also put forward that his two shells were variants of one species, and he allowed that my series seemed to bridge the interval between the two. Being persuaded they are conspecific, I have named them *B. perversidens*, which has priority, making *B. cybœa* a variant.

In all my specimens the right valves have much more pronounced sculpture than the left, especially the radial. Some shells have the sinuation at the gape quite deep, with the depression from this to the umbo marked, others but slight, and others not at all. Some have quite a distinct angle at middle of the posterior side, where a straight-dorsal half meets the rounded ventral part; in others the posterior side is continuously curved.

It is interesting to note the very wide area of distribution of this small species: over 36 degrees of longitude and in almost identical latitudes.

Philobrya cuboides, *sp. nov.* Pl. xxviii., figs. 5, 6, 7, 8, 9.

Shell minute, solid, subrhomboidal, inflated, equivalve, inequilateral, varying in different specimens. Anterior margin forming rather more than a right angle with the dorsal border, and straight for one-half its length, then sweeping with a large curve into the convex ventral margin. Posterior margin forming a more obtuse angle with the dorsal border, nearly straight throughout its whole length, and joining the ventral margin by a rounded angle. Umbos provided with adherent embryonal scales, which are thick, slightly more than a semicircle, their diameters almost opposed, their centres slightly prominent, the borders of their circumference, but not of their diameters, margined and slightly reflected. Infraumbonal ligamental area narrow and long. Hinge-line wide, of two parts joined at an open obtuse angle where it is narrowest. Cartilage-pit excavated in the ligamental area from the umbonal scale, directed obliquely backwards. Anteriorly to the pit are two stout, erect oblong teeth, directed backwards and inwards. Posteriorly are three stout, erect, nearly oblong teeth, directed almost transversely forwards and inwards.

Sculpture.—The surface has close-set, broad, low, radial ribs, and rather narrower concentric ribs, at about equal distances. The inner margin of the shell is denticulated; not at all, or only slightly on the straight parts.

Dimensions.—Umbo-ventral, 2·75 mm.; antero-posterior, 2·15 mm.; sectional of the closed valves, 1·5 mm.

Locality.—Backstairs Passage, 20 fathoms, 30 alive, many dead: Spencer Gulf, deep water, 13 alive.

Obs.—In life it is covered with a conspicuous thick periostracum, projecting as a hairy fringe along the ribs and beyond the margins. The shell is tinged throughout, or blotched with pinkish-brown.

Variations.—Typically the umbos are subcentral, rather nearer the anterior end of the hinge-line. In some specimens they are much nearer the front, when the cartilage-pit is longer and more oblique, and the whole shell is more oblique. The umbo-ventral diameter may be, in some instances, atypically greater than the antero-posterior. The dorsal border may be atypically short, and the dorso-lateral angles too obtuse, so as to give a circular rather than a quadrate outline to the margin of the shell.

Its exact generic location is somewhat doubtful.

Trigonia margaritacea, Lamarck, *var.* **bednalli,** *var. nov.*

Pl. xxviii., figs. 1, 2, 3.

Trigonia margaritacea, Lamarck, Ann. du Mus., vol. iv., p. 355, pl. lxvii., fig. 2. *T. pectinata*, Lamarck, Anim. S. Vert., 1819, vol. vi., p. 63: Encyc. Meth., 1832, vol. iii., p. 1048.

The shell here referred to was first taken on the South Australian shore, between Glenelg and the Semaphore, by Mr. W. T. Bednall, about the year 1865, and was catalogued by him in a list of South Australian shells, published (for private circulation only) in 1875, and was noticed in his excellent paper on "Australian Trigonias and their Distribution," in Trans. Roy. Soc. S. Austr., vol. i., 1878, p. 79, under the name of *T. margaritacea*, Lamarck. He said:—"Its particular habitats in our waters have not yet been discovered, no live specimens having yet been dredged." In vol. ix., pp. 101-102, Tate recorded it as having been "dredged in life from 8 fathoms in Encounter Bay (R. H. Pulleine)." A few years later, when I had the pleasure of Mr. Bednall's company on one of my earlier dredging excursions, we discovered it in St. Vincent Gulf, and obtained about 70 specimens, living and dead, from 15 to 20 fathoms, in Yankalilla Bay. Dredging since then has revealed a considerable range, both in depth and area, as shown by the following details:—It has been taken alive at 10 fathoms, 2 small examples; 12 fathoms, 7; 14 fathoms, 3; 15 fathoms, 3; 17 fathoms, 15; 19 fathoms, 16; 15 to 20 fathoms, about 50; 22 fathoms, 18. They have been taken as valves from 9 up to 200 fathoms. They have extended from Wallaroo Bay, at 15 fathoms, throughout Spencer Gulf, through Investigator Strait, in St. Vincent Gulf, as far up as Yankalilla Bay, and through Backstairs Passage. Beyond this, as far as Beachport, where I have only tested at depths from 49 to 300 fathoms, none but dead specimens have been obtained; though 1 example, the largest in my cabinet, perfect, and quite recent, and of a white colour, was brought up from 110 fathoms at this most easterly of my stations. Their zone is manifestly from 12 to 23 fathoms, only stragglers occurring at less depths, and dead shells at greater depths.

They are very varied in colour, white, pale yellow, light orange, delicate mauve, pink, "crushed strawberry," and purple.

This variety is characterized by its very compressed shape, its narrow ribs, its large, oblong, plate-like spines, broader at their free than at their attached ends, features which are exceedingly constant in the very large series obtained. *T. lamarckii, var. reticulata*, Ten. Woods, found off the coast of New South Wales, is regarded by Mr. Hedley

as the same species, as is also *T. acuticostata*, McCoy (Memoirs Austr. Mus., iv., part 5, 1902, p. 301).

The late Mr. Dennant kindly compared our South Australian shells with McCoy's fossil form from Victoria, and he thought they were not identical, nor conspecific with *T. reticulata*, Ten. Woods. However, I think it is too closely allied to be regarded as a distinct species, so it has been placed as a variety of *T. margaritacea*, Lamarck.

Among the many hundreds of valves and living specimens dredged by me, only 1 has shown any marked departure from the type of this variety. This was taken alive at 23 fathoms in St. Vincent Gulf, together with 2 others, which quite conformed to the type. This unique individual exactly resembled a half-grown specimen of the common *T. margaritacea*, Lam., obtained from Tasmania. The only other aberrant from our form seen by me is a specimen taken by Mr. Zietz, at Corny Point, Spencer Gulf. It has the spines of *T. margaritacea* and the same number of ribs, but the shape is more that of *T. lamarckii*, found in Port Jackson, only with fewer ribs and fewer spines, and with an even longer and more concave posterior border, in which last character it departs greatly from our South Australian variety. The occurrence of these two marked aberrants among numerous examples of the ordinary form indicates some other explanation for our variety than either locality or depth of water

Modiola penetecta, n. sp. Pl. xxviii., figs. 15, 16, 17, 18.

Shell small, thin, ovate, ventricose. Beaks apposed, inflated, oblique. Post-dorsal line nearly straight, 11 mm.; anterior-dorsal line, 2 mm. Ventral border anteriorly slightly convex for 8 mm.; then rather more convex, and merging into the semicircular posterior end, which, with a more open dorsal sweep, forms a faint rounded angle with the post-dorsal line. A heart-shaped area, 10 mm. by 8 mm., on the united valves anteriorly is bare and glistening and sculptured with very low lamellar accremental striæ. The rest of the shell is very closely invested with a felted periostracum of short hairs, with short, blunt projections on each side. Internal border simple. Horn-coloured, lighter on the umbonal ridge. Internally chestnut-brown in front, and with pinkish-brown concentric bands, most marked, in the dorsal two-thirds, elsewhere a bluish-white.

Length, 21 mm.; breadth, 13 mm.; thickness, 11 mm.

It differs from *M. australis*, Lamarck, in its shorter, rounder, anterior end, its greater proportional breadth, and its rounder posterior end. Its hairs are more numerous and close-set, shorter, and "elk-horn" in shape, instead of simple.

Habitat.—Dredged alive in numbers in mud at 10 fathoms, off Banks Islands, and at 15 fathoms in Wallaroo Bay, Spencer Gulf.

Glycimeris pectinoides, Deshayes. Pl. xxviii., fig. 4.

Pectunculus pectinoides, Deshayes, Cuv., Régn. Anim (Fortin and Masson's illustrated edition), Mollusques, pl. lxxxvii., f. 8. Illustrations Conchyliologiques, Chenu, *Pectunculus,* pl. ii., f. 2: Reeve, Conch. Icon. *Pectunculus,* pl. viii., f. 44. *Pectunculus gealei,* Angas, Proc. Zool. Soc. Lond., 1873, p. 183, pl. xx., f. 5. Type locality, off Port Macquarie, N.S. Wales. Tate, Trans. Roy. Soc. S. Austr., 1891, vol. xiv., part 2, p. 268; *(Glycymeris),* Tate & May, Proc. Linn. Soc. N.S. Wales, 1901, vol. xxvi., part 3, p. 436. *Pectunculus flabellatus,* Ten. Woods, Trans. Roy. Soc. Vict., 1878 (1877), vol. xiv., p. 61, 62. Type locality, Victoria and Tasmania: Tate, Trans. Roy. Soc. S. Austr., 1886, p. 103, No. 134: *(Glycimeris),* Pritchard and Gatliff, Proc. Roy. Soc. Vict., 1904, vol. xvii. (n.s.), part i., p. 243. *Pectunculus orbicularis,* Angas, Proc. Zool. Soc. Lond., 1879, p. 420, pl. xxxv., f. 9. *Pectunculus beddomei,* E. A. Smith. Chall., Zool., 1885, vol. xviii., p. 255, pl. xviii., f. 1, 1b.

Our South Australian shell was first recorded by Tate as *P. flabellatus,* Ten. Woods, in 1886; later as *P. gealei,* Angas, in 1891. The species figured by Chenu as *P. pectinoides,* Deshayes, and described and figured by Reeve as *P. pectenoides,* cannot be distinguished from a half-grown example of our shell. Reeve gives "Bay of Panama" as its locality, and says:—"After receiving from M. Deshayes the example of this species, originally described by him, Mr. Hinds supplied me with finer specimens from the collection of Captain Belcher." The habitat is far distant, but our shells appear conspecific.

It is not a common shell on our beach, but is fairly abundant in deeper water. It has been dredged in Spencer Gulf from Wallaroo Bay to Thorny Passage, in Investigator Strait, in St. Vincent Gulf, and through Backstairs Passage as far as Beachport. It has been taken alive at all depths between 8 and 30 fathoms, but is most numerous about 22 fathoms. Valves have been secured at all depths explored up to 150 fathoms off Beachport in decreasing quantities.

It is a very variable shell. When young it has an orbicular shape, being rather longer than high, and having a long, straight dorsal border. As it grows, it becomes higher than long, and its dorsal border is proportionally much shorter. It generally remains almost symmetrical; rarely it becomes quite decidedly oblique.

It may vary in obesity. One example, 41 mm. high, may be 30 mm. in section; another, 37 mm. high, may be only 20 mm. in section. The latter are of the compressed *P. bed-*

domei form. It is not explained by senility, for in young individuals an equal disparity is seen.

It may attain a height of 50 mm., a length of 51 mm., and a section of 35 mm.

The ribs differ. Generally they are broad and rounded, wider than the interspaces, which are deep and flat, with vertical sides. But sometimes the ribs are low and wide, and touch one another, so as to have no intervening squarely-ploughed furrow. The concentric sculpture usually consists of flattened contiguous plates on the ribs, while in the intercostal spaces there are low, vertical, thin lamellæ. But it may be no more than crowded concentric liræ, both on the costæ and between them.

The "lunular area" referred to by Angas is on the posterior side of the shell, and therefore does not correspond with the lunule of such shells as Chione. It may be very defined, or only slightly marked or absent.

Not a few individuals, after reaching a diameter of 25 mm., cease to grow in superficial area, but increase in sectional diameter, while they actually decrease in their umbo-ventral; so that their margin becomes curiously incurved and their walls very thick, as figured in pl. xxviii., fig. 4.

As to ornament, some shells in life are nearly white without and quite white within; others are of an almost uniform cinnamon-brown. The usual colour is a dirty-greyish or very faint rusty tint, with rather reddish-rusty indistinct blotches, disposed in irregular and broken concentric lines; but they may have a pure white-ground colour, marked with long radial, dark purple-brown spots, variously disposed in patterns, or scattered, or coalescing into a large area over the ventral part of the posterior half of the shell.

So within, some are quite white; others have a dark-brown line along the pallial margin, and edging each adductor scar; others have the muscle-scars and the greater part of the interior of a dark purple-brown.

The extent to which the muscle-scars, anterior or posterior, are supported by a callosity also differs greatly.

There is every combination of the above-named differences, so that no true varieties can be established; only individual variations are recognized.

Glycimeris sordidus, Tate.

Pectunculus sordidus, Tate, Trans. Roy. Soc. S. Austr., 1891, vol. xiv., p. 264, pl. xi., f. 8. Type locality, St. Vincent Gulf, 9 to 11 fathoms, alive (Verco). I have taken it since in numbers in Hardwicke Bay, in Backstairs Passage, and in Investigator Strait, at all depths from 13 to 22 fathoms.

Professor Tate had only an immature individual from

which to describe his new species, and the figure given is a rather faulty representation of his type. Material obtained since furnishes the following information, and establishes it as a true species.

The dimensions given are:—Antero-posterior, 20 mm.; umbo-ventral, 18; sectional diameter, 10·5. My largest example measures 36 by 37 by 19·5. As it grows it therefore tends to become comparatively shorter antero-posteriorly, and more obese in section. Two individuals, each 32·5 and 33 mm. in the above measurements, have respectively sectional diameters of 20 and 16 mm., demonstrating very great difference in ventricosity.

There is a marked tendency to rest-periods in its growth, producing, at intervals of about 5 millimetres, concentric steps from a half to one millimetre in depth. There are usually four of these in the adult; there may be six. Then they rapidly become closer and less valid, until the senile stage is reached, when the shell increases much in obesity and very little in altitude, and they are reduced to close-set concentric striæ.

The species is appropriately designated "sordidus," for most shells show scarcely any colour markings on their dirty-white surface. But some are irregularly sparsely dotted with reddish-brown, in somewhat zigzag concentric lines, and are ornamented with four broad, curved, dark purple-brown flames, crossing the anterior and posterior marginal areas of the shell.

Thracia myodoroides, E. A. Smith.

Thracia myodoroides, E. A. Smith, Chall. Zool., 1885, vol. xiii., p. 70, pl. vi., f. 6-6b. Type locality, off East Moncœur Island, Bass Strait, in 38 to 40 fathoms: Pritchard & Gatliff, Proc. Roy. Soc. Vict., 1903, vol. xvi (n.s.), part i., p. 104.

This shell was recorded for South Australia by Professor Tate under the name of *Thracia modesta*, Angas, from Tapley Shoal, in Trans. Roy. Soc. S. Austr., 1888, vol. xii., p. 67.

It has been dredged alive at all depths between 8 and 22 fathoms; most abundant at 20 to 22 fathoms. Valves are found at all depths up to 60 fathoms; most numerous between 15 and 22 fathoms. It is fairly abundant, and is distributed from Beachport westward through Spencer and St. Vincent Gulfs.

As the shell grows larger, it changes in shape, becoming proportionally longer antero-posteriorly; thus the type is 13 mm. long by 9·5 mm. high. Other individuals are 16 by 10 and 18 by 11, whereas they should be 11·6 and 13·1 in height respectively.

Thracia concentrica, n. sp. Pl. xxviii., figs. 12, 13, 14.

Shell, rhomboid-oval; anterior-dorsal border straight, scarcely convex; posterior-dorsal border rather more concave; ventral-border uniformly slightly convex, joining the anterior border with a sharp curve; posterior end nearly vertically truncate, scarcely rounded at the superior angle, more at the inferior. A rounded umbonal ridge curves to the posterior inferior angle. Numerous valid, round, rude, incomplete, ill-curved concentric ribs frequently overlap in the median area. Fine crowded, crooked, radial incisions cross the ribs and spaces, and interrupt more crowded concentric incisions, so as to produce a microscopic shagreen pattern. There is a depressed lanceolate dorsal area behind the umbo, at the margin of which the ribs cease, and which is finely antero-posteriorly striate. In the right valve is a very narrow furrow within the dorsal borders for the edge of the left valve, and its inner margin behind the umbo projects as a laminar tooth, soon vanishing posteriorly. The inner surface is glistening, and has faint radial substriations. The pallial sinus is of moderate depth and round.

Dimensions.—Umbo-ventral, 10·8 mm.; antero-posterior, 14·1; sectional, 4·9.

It has not been dredged alive or with united valves, and one cannot be certain about its left valve.

It closely resembles *T. myodoroides*, of Smith, but is more ventricose, has a concave post-dorsal border, and is much more validly concentrically ribbed.

Habitat.—23 fathoms, Backstairs Passage.

Thracia lincolnensis, n. sp. Pl. xxviii., figs. 19, 20, 21.

Shell, thin, white, elongate-oval; anterior-dorsal border nearly straight, scarcely convex; posterior cancave; ventral border almost straight in the posterior half, arcuately ascending in the anterior. Anterior end attenuately rounded, posterior end vertically, straightly truncate; superior and inferior posterior angles rounded. Right valve slightly more convex than the left, which is included all round except at the posterior end. Quite obsolete, flat, irregular concentric ribs, with very faint miscoscopic concentric striæ. The right valve has a groove inside its dorsal margin, except at the umbo, to receive the left valve, and the inner edge of the groove projects to form lamellar teeth, most marked just in front of and behind the subumbonal notch. The pallial sinus is wide and round, and reaches nearly to the centre of the shell. The umbos are acute, incurved, and apposed.

Dimensions.—Antero-posterior, 7·3 mm.; umbo-ventral, 5·1 mm.; sectional, 3 mm.

It somewhat resembles *T. myodoroides*, E. A. Smith, but is smaller, though its proportions are the same. It differs in having a concave instead of a straight post-dorsal line, in not being excavate in front of the umbo, and in having a deeper pallial sinus.

It differs from *T. modesta*, Angas, in being longer posteriorly, and so more equilateral, and in a vertical truncation instead of one sloping upwards and backwards.

Habitat.—Dredged alive at 9, 20, 22, and 24 fathoms, at Port Lincoln, at Yankalilla Bay, and in Backstairs Passage.

Pholadomya arenosa, Hedley.

Thraciopsis arenosa, Hedley, Proc. Linn. Soc. N.S. Wales, 1904, vol. xxix., part i., p. 197, pl. ix., figs. 26-27. Type locality, 100 fathoms, east of Wollongong, N.S. Wales, one valve.

Pholadomya arenosa, Hedley, *op. cit.*, 1906, vol. xxxi., p. 464, Masthead Island, Queensland.

Mr. Hedley has kindly identified my specimens by comparison with his type. Its dimensions were only 4·55 mm. by 2·9 mm; a valve taken in 20 fathoms in Backstairs Passage measures 12 mm. by 7 mm. The typical shape and ornament are retained when adult.

Dredged alive in 5 fathoms, St. Vincent Gulf; dead in Spencer Gulf, Backstairs Passage, and in 62 fathoms northwest of Cape Borda.

EXPLANATION OF PLATES.

Plate XXVII.

Fig. 1. *Limopsis vixornata*, Verco.
,, 2. *Limopsis eucosmos*, Verco.
,, 3. *Nucula beachportensis*, Verco.
,, 4. 4*a*, 4*b*. *Nuculina (Cyrilla) concentrica*, Verco.
,, 5. *Limopsis tenisoni*, Ten. Woods, var. *penelevis*, Verco.
,, 6. 6*a*. 6*b*. 6*c*. 6*d*. *Sepia braggi*, Verco.
,, 7. *Lissarca rhomboidalis*, Verco.

Plate XXVIII.

Fig. 1, 2, 3. *Trigonia margaritacea*, Lamarck, var. *bednalli*, Verco.
,, 4. *Glycimeris pectinoides*, Deshayes; senile state.
,, 5, 6, 7, 8, 9. *Philobrya cuboides*, Verco, showing exterior, interior, dorsal view, and umbonal scale.
,, 12, 13, 14. *Thracia concentrica*, Verco, showing minute sculpture, side view, and dorsal view.
,, 15. Hair from *Modiola australis*, *Lamarck*.
,, 16. Hair from *Modiola penetecta*, Verco.
,, 17, 18. *Modiola penetecta*, Verco.
,, 19, 20, 21. *Thracia lincolnensis*, Verco, side view, dorsal view, and imaginary umbo-ventral section.